Feb. 3, 1925. 1,525,235

C. C. HANSEN

SOIL SAMPLING TOOL

Filed Jan. 16, 1923

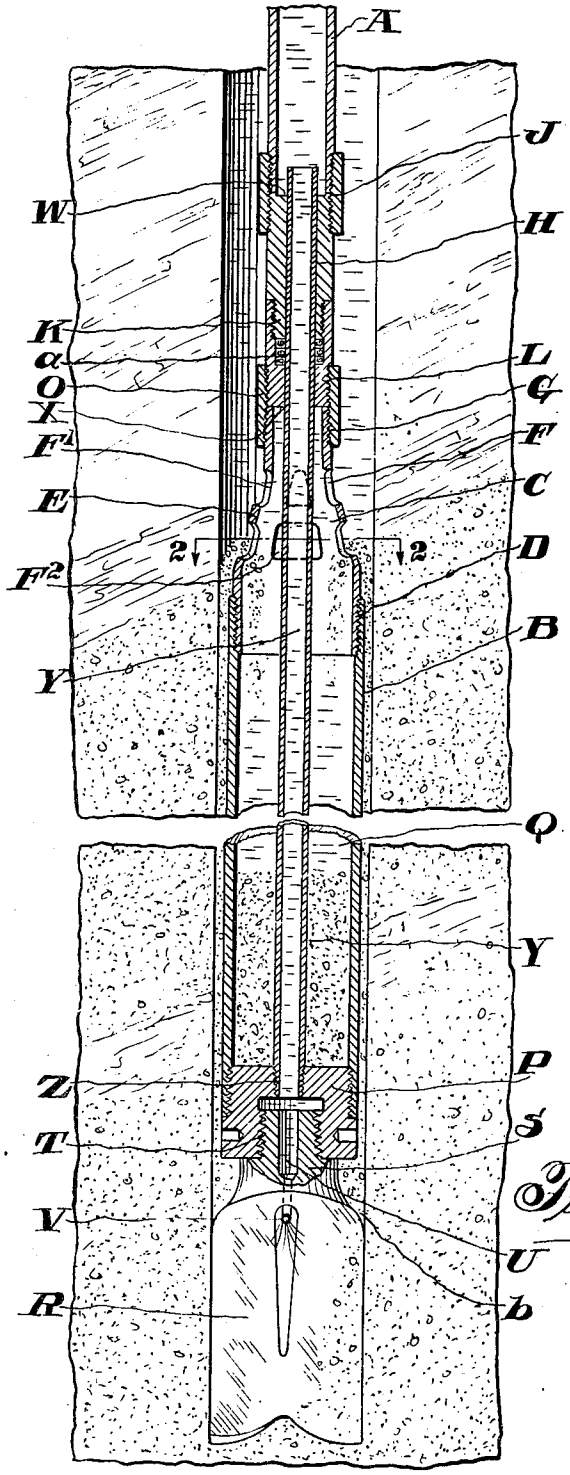


Fig. 1.

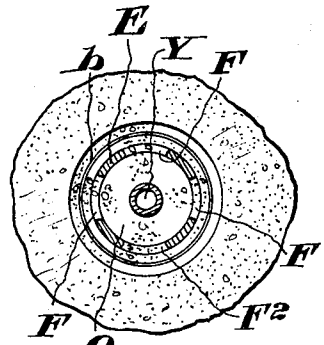


Fig. 2.

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Patented Feb. 3, 1925. 1,525,235

UNITED STATES PATENT OFFICE.

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SOIL-SAMPLING TOOL.

Application filed January 16, 1923. Serial No. 613,013.

To all whom it may concern:

Be it known that I, CHARLES C. HANSEN, a citizen of the United States, and a resident of Easton, in the county of Northampton, State of Pennsylvania, have invented a certain Soil-Sampling Tool, of which the following is a specification accompanied by drawings.

This invention relates to soil sampling tools and particularly to a tool in the nature of a rotary drill, adapted to obtain samples from earth strata which are more or less dry and loose in formation and too soft for solid coring.

It has heretofore been extremely difficult to obtain satisfactory specimens of earth formation, especially in oil bearing strata, where the subsoil is dry and loose, particularly where several different strata are encountered at one location. These strata may comprise clay, loose earth, stone, gravel and dry or oil-bearing sand, which will not hold together en masse for extraction by the usual or standard form of core drill, and in fact may comprise any material through which a fish-tail bit for instance will pass. It is a practical impossibility to obtain satisfactory solid cores in such combined formations, and means have been devised for extracting such specimens by loosening the material and conveying it into a so-called "calyx" bit by hydraulic means, a reversed loose core being thus obtained. The latter method as usually practiced is expensive and has other drawbacks.

The primary object of the present invention is to obviate the disadvantages inherent in drills adapted to obtain reversed loose samples of the material worked upon by simplifying and improving the construction of rotary drills adapted for such purposes, so that reversed samples composed of loose earth, sand and other incohesive material may be efficiently and expeditiously obtained. A further object is to enable the barrel and its contained sample to be readily and quickly removed from the operating parts of the drill. A still further object is to permit the use of a fish-tail drill bit in a rotary drill, this type of bit having been found to be very satisfactory for drilling in soft material, such as sand, broken and rotten stone and similar formations.

With the above and other objects in view, the present invention consists in features of construction and operation set forth in the following specification and illustrated in the accompanying drawings, forming a part hereof, in which—

Figure 1 is a vertical elevation in section, showing the soil sampling tool as it appears in use, and

Figure 2 is a transverse section on the line 2—2 of Figure 1, looking in the direction of the arrows.

Referring to the drawings, the soil sampling tool is shown in a preferred form, adapted to be connected to the rotary hollow drill rod or spindle A of a rotary drill or other rotary machine suitable for drilling purposes. The soil sampling tool comprises a hollow collector or barrel B of uniform internal and external diameter, having a hollow smaller diameter cap portion C threaded within the upper end as shown at D, the cap C having inclined sides E containing a plurality of apertures F adapted to communicate with the interior of the cap C and barrel B. In the present instance, two series of apertures are shown, an upper series F′ and a lower series F^2 each series comprising four apertures. The cap C terminates in a threaded end portion G having the same diameter as the rod A. A connecting bushing H of substantially the same diameter as the drill rod A is adapted to be secured to the drill rod A by a coupling J and this bushing H has a smaller diameter end portion K threaded into a complementary bushing L. The bushing L is secured to the threaded end G of the cap C by a coupling O. The organization of parts just described illustrates a preferred manner of securing the soil sampling tool to the rod A. A plug P threaded into the lower end of the barrel B forms a base for the collecting chamber Q within the barrel.

A hollow rotary fish-tail boring drill bit R of relatively larger diameter than the barrel B is secured to the plug P by a tapered stem S threaded into a recess T in the outer end of the plug P. The bit R may be of any approved type but a two-winged fish-tail bit as shown has been found to be satisfactory for work of the character for which the apparatus of the present invention is particularly adapted.

The bit R is hollow, i. e., it is provided with an axial bore or hole U which is in communication with the exterior of the bit

R as shown at V. The bushing H and complementary bushing L also have axial bores W and X respectively, concentric with the bore U and a liquid conveying tube Y is adapted to pass through the bores W and X and centrally through the chamber Q, and the lower end of the tube Y is threaded in the plug P as shown at Z. Suitable packing *a* is provided in the joint between the bushing H and the complementary bushing G.

The tube Y affords communication between the hollow drill rod A and the bore U of the drill bit so that liquid, usually water, may pass freely from the interior of the rod A, to the bore V and to the base of the hole being drilled, designated herein by *b*.

In the operation of the apparatus, detritus is produced at the base of the hole and the velocity of the water or other liquid, the flow of which is usually constant during the drilling, causes the detritus to pursue an upward course through the annular space left around the outside of the barrel B by the clearance of the bit R. When the flowing mixture reaches the portion of the hole adjacent to the smaller diameter cap C, the velocity is reduced somewhat, due to the gradually increased volume of the hole at this point, and the reduction in velocity gradually becomes more pronounced adjacent to the inclined sides E and apertures F, so that the water finally ceases to act as a propellant, and the solid matter composed of cuttings and detritus, pursuing the line of least resistance, finds its way through the apertures F to the interior of the cap C, from whence it settles in the barrel B and is deposited on top of the plug P in the chamber Q in the form of a reversed sample of the drilled material, the water, minus the detritus, passing out of the hole in the usual manner. The higher the velocity of the water, the greater charge of material will it carry and as the velocity is reduced, part of this material will be precipitated or separated from the water and will settle in the place where the current is least, or where there is no current. A space has been created inside the barrel without any current, so that consequently the material will be deposited inside the barrel and a partial sample in reversed order will be obtained of the strata of material drilled.

The soil sampling tool is then removed from the hole and the barrel B separated from the cap C or plug P, or both, by unscrewing either or both of these parts, and the material is expelled into a trough, glass tube, or other suitable container.

In the use of rotary drills it is often difficult and sometimes impossible to obtain satisfactory operation in certain loose earth formations owing to the character of the material being drilled, which prevents the forming of a walled hole. When drilling through strata of earth or clay which permits the forming of a mud-laden fluid during the drilling, the sides of the hole become purposely plastered with mud so that the sides do not collapse and jam around the barrel or otherwise prevent or impede the upward flow of liquid and detritus. In drilling through strata composed entirely of loose material having a tendency to pack around the drill, resort may be had to the expedient of supplying a mud-laden fluid through the drill with which to plaster the walls of the hole, and the present device is adaptable for such operation also, in cases where the same is deemed desirable or necessary. However, when loose material, such as oil-bearing sand, is encountered, the use of the present construction having the fish-tail bit enables the operator to obtain a satisfactory sample of the desired strata and it is not necessary to use mud-laden fluid to prevent collapse of the walls of the hole.

The usual or ordinary type of core drill may be employed until the oil-bearing sand or other incohesive material is encountered, after which the present soil sampling tool is intended to be substituted on the drill rod and the desired reverse sample of such material readily obtained without the use of a mud-laden fluid.

I claim:

1. A rotary soil sampling tool adapted to be connected to the hollow rod of a rotary drill, comprising a hollow barrel, a plug at one end of said barrel, a rotary boring drill bit secured to said plug, a hollow cap forming a part of said barrel, said cap having an end portion of decreasing diameter at the point connecting with the drill rod, and a plurality of apertures in said decreasing diameter portion affording communication with the interior of said cap and barrel, bushings adapted to connect said rod and cap, and a liquid conveying tube extending from the hollow drill rod centrally through said bushings and barrel and into said plug and adapted to convey liquid from the hollow drill rod through the said apertures in the base of the bit to the base of the hole being drilled, whereby detritus is caused to pursue an upward course around the barrel of the tool and then through said apertures and into the interior of the barrel in the form of a reversed sample of drilled material.

2. A rotary soil sampling tool adapted to be connected to the hollow rod of a rotary drill, comprising a hollow barrel of uniform external diameter, a plug at one end of said barrel, a fish-tail drill bit of relatively larger diameter secured to said plug, a hollow cap threaded within the end of said barrel, said cap being of lesser diameter than said barrel, said cap having an end portion of gradually

decreasing diameter with inclined sides, at the point of connection with the drill rod, and containing a plurality of apertures in said decreasing diameter portion affording communication with the hollow interior of said cap and barrel, bushings adapted to connect said spindle and cap, and a liquid conveying tube extending from the hollow drill rod centrally through said bushings and barrel and into said plug and adapted to convey liquid from the hollow drill rod to said plug and through the said apertures in the base of the bit and to the base of the hole being drilled, whereby detritus is caused to pursue an upward course around the barrel of the tool and then through said apertures, and into the interior of the barrel in the form of a reverse sample of drilled material.

In testimony whereof I have signed this specification.

CHARLES C. HANSEN.